1

The Business Plan

1.1 Introduction

Wireless broadband networks are very different from the traditional voice networks, hence should not be deployed as an extension of those. A greenfield operator should start the conception of a new network by building a business case. An existing network benefits also from a proper business case, even if it is done during its operational life.

A properly designed business plan requires a small investment upfront, but substantiates the investment and can be used to leverage capital. Thus investors are not surprised by unexpected cash flow requirements or by unforeseen technical or operational issues. Figure 1.1 illustrates the main components of a business plan.

A business plan has three main components, described in detail in the next sections:

- the market plan;
- the engineering plan;
- the financial plan.

1.2 Market Plan

Understanding the market is essential to define the product offering and its acceptance by the market. This should be done through market research, which could be exploratory or confirmatory.

- In the exploratory case, options are left wide open and the results from the research will define the outcome.
- In the confirmatory case, a set of assumptions is made and are confirmed or not by the research.

A market research is divided into three areas:

- market information: where information is collected;
- market segmentation: where demographic, psychographic, ethnographic and lifestyle information is gathered;
- market trends: where market evolution over time is predicted.

LTE, WiMAX and WLAN Network Design, Optimization and Performance Analysis, First Edition.
Leonhard Korowajczuk.

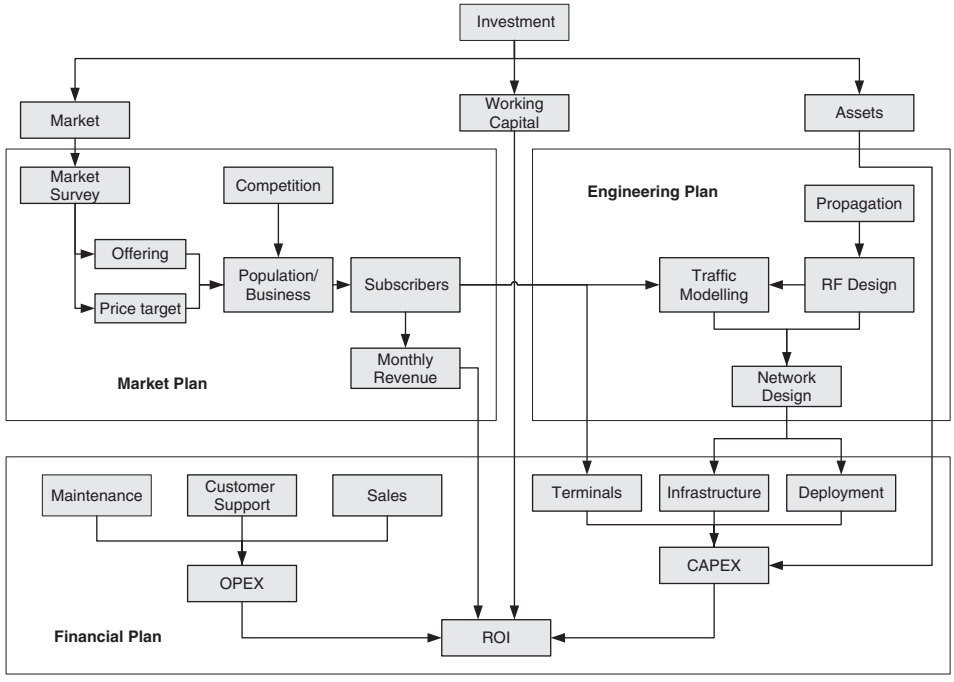


Figure 1.1 Business plan.

Market research can be done in four phases:

- *Market scan*: collection and analysis of available data that can contribute to the subject. Optionally customer visits can be done at the location where they use the service (businesses or residences), to ask broad questions about their satisfaction with existing services and their willingness to accept alternative offerings.
- *Options generation*: unconstrained options should be formulated to define all possible offerings.
- *Option selection*: each option should be evaluated based on the previously collected data and the best ones selected. The proper technique for this selection is choice modeling, which categorizes the data for each choice.
- *Selected options evaluation*: a customer survey should be done, with questions specific to each option.

Market research should be done by a specialized professional or company, as many of the network assumptions are based on it. It should be done periodically for existing deployments as well, so the service can be adapted to customer expectations and expansions can be properly planned.

The outcome of market research is the market plan, which should aid network designers by specifying the following items:

- *Service target area (STA)*: area in which service should be provided. It can constitute a single continuous area or several separate areas. These areas should be then divided in sub-areas classified by characteristics such as type of service expected and demand.

- *Product*: product to be offered, its features and restrictions. This includes service plans and its SLA (service level agreement).
- *Service coverage*: coverage area.
- *Client demographics* for the STA.
- *Client evolution* over the years.

1.3 The Engineering Plan

The engineering plan defines the design that fulfills market plan requirements. A complete design should be done, even if the equipment vendor is not yet defined.

Many vendors want to do an initial estimate of the number of cells required for a deployment, for budgetary reasons. The most common question asked to the network designer is: What cell size should be considered for the budgetary quote?

There are many factors that affect cell size:

- RF signal propagation, which depends on the environment and is mistakenly used as the sole criterion.
- Location where service will be provided (rooftop, outdoor, indoor).
- Spectrum availability and, consequently, expected interference.
- Equipment to be used.
- Amount of traffic to be carried in each location and its distribution.

These items interact with each other and cannot be treated separately. As an example, if the traffic to be carried is high, we need to resort to higher modulation schemes that require stronger signals and are more prone to interference. We generally give a range that can be applied. A common mistake is to consider a uniform traffic distribution, which leads to significant under-estimation of the infrastructure required.

Table 1.1 gives an idea of the variability of number of sites required in different scenarios. We strongly suggest that an initial design be done, so more precise numbers are used.

Ideally, a drive test should be conducted to collect measurements and calibrate RF propagation models for the area. Default propagation parameters can be used, but this will cause some imprecision.

The design step requires the designer to become familiar with the operator's intentions and with all facilities and restrictions of the area and of the license. A questionnaire should be sent to the operator, followed by an interview to gather the required information. This information guides the design effort. The following is a list of the main questions that should be answered:

- What is the spectrum available, its regulations and restrictions?
- What geographical data bases are available and is their quality good enough?
- What are the deployment plans?
- Are there any preferred vendors?
- What are the arrangements for wireline, Internet and backhaul connections?
- What are the site deployment restrictions?

The traffic-carrying capacity of the initial design must first be verified by using a noise rise figure to account for interference, as at this stage the network optimization has not yet been carried out. A traffic simulation can pinpoint traffic flow issues which should be corrected by redesign.

The cells' footprint should be enhanced and network resources (neighbors, frequencies, codes and parameters) should be optimized.

Table 1.1 Number of sites for an initial design

	Cell radius (km)		Effective area (km^2)		Cells/100 km^2	
Scenario	min	max	min	max	max	min
Rooftop	1	5	2.20	54.98	46	2
Outdoor ground	0.5	1	0.55	2.20	182	46
In-vehicle	0.3	0.7	0.20	1.08	506	93
Indoor window	0.2	0.4	0.09	0.35	1137	285
Indoor	0.1	0.25	0.02	0.14	4548	728

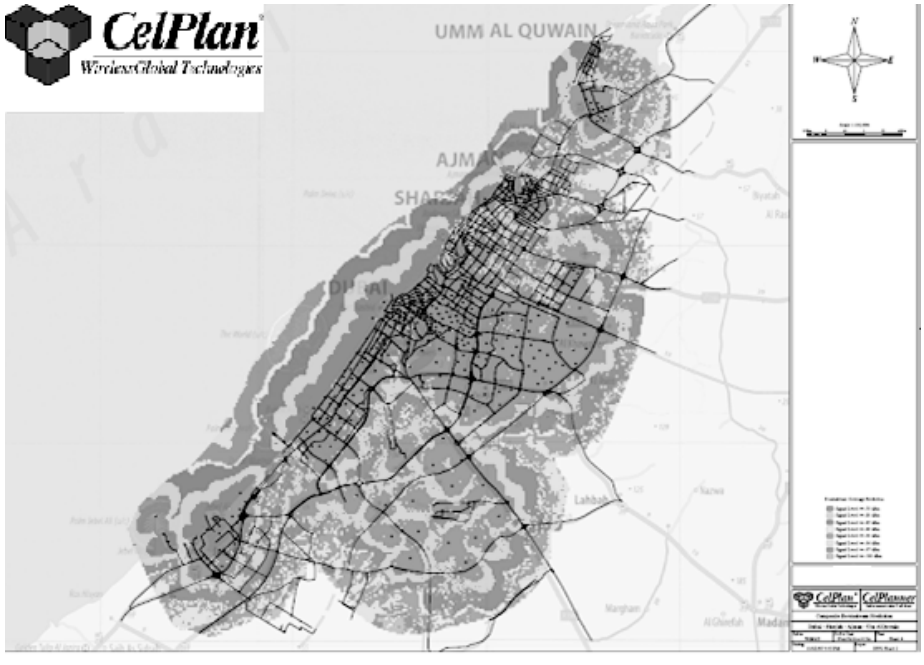


Figure 1.2 Planning tool prediction.

Finally, a performance analysis should be done and KPIs (Key Performance Indicators) should be compared with SLA (Subscriber Level Agreement) requirements.

The engineering plan must be updated during the life of the equipment, as it will play an important role in SON (self-organizing network) features to be introduced in most networks in the near future.

The design for the engineering plan should be done using a professional planning tool and experienced engineers. Broadband wireless designs require expertise and cannot be done in the same way as narrowband designs. A screenshot of such a planning tool is shown in Figure 1.2.

1.4 The Financial Plan

The financial plan analyzes the venture's financial feasibility and requirements. There are many specialized software packages that generate a financial plan according to the technology. These software

packages are very good for initial ballpark estimates and can be updated as the project matures. Since they rely on many estimates, such as spectrum efficiency and penetration rates, which are very subjective, their inputs must be based on solid market and engineering plans, otherwise they can lead to any type of conclusion. It is strongly recommended that these software packages are used after or in parallel with the market and engineering plans. Screenshots from a financial planning tool are shown in Figure 1.3.

1.4.1 Capital Expenditure (CAPEX)

CAPEX summarizes capital investments per year, based on the market plan and engineering plan. Non-operational capital investments, such as office furniture, cars and vehicles, should also be considered. The main items that constitute the CAPEX are:

- Spectrum purchase (if any)
- Site construction and development
- Site infrastructure (power, batteries, air conditioning)
- Base station equipment
- Core equipment
- Backhaul equipment

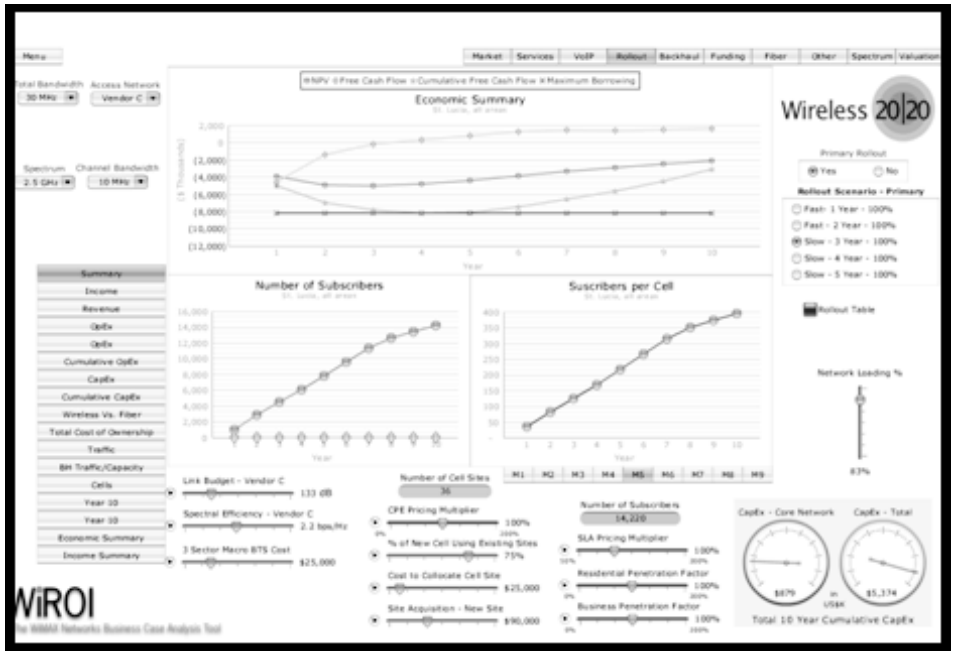
1.4.2 Operational Expenditure (OPEX)

OPEX summarizes operational expenses, including leases, rents, operation and maintenance personnel.

- Site rental costs
- Site and backhaul maintenance costs
- Backhaul fees (fiber lease)
- Internet access costs
- Wireline interconnection costs
- VoIP termination costs
- CPE installation costs
- CPE subsidies
- Billing costs
- Customer care costs
- Engineering team costs
- Marketing costs
- Sales commission costs
- Promotion costs
- Bad debt
- Financial costs
- Administration staff
- Indirect costs

1.4.3 Return of Investment (ROI)

The required investment and its return can then be calculated on a yearly basis. Several other financial indicators can be calculated, such as the income statement and balance sheet.



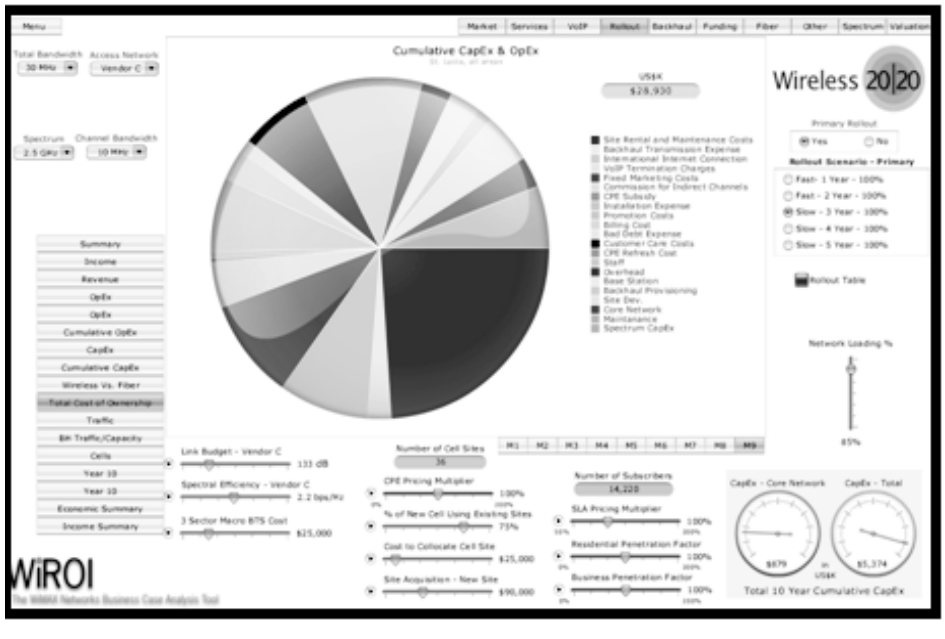


Figure 1.3 Financial planning tool screenshots.

1.5 Business Case Questionnaire

Unfortunately, in many cases market research is not done and the engineering information is not available either. In this case the designer has to obtain the information himself. This can be done by researching public information, local government agencies and by interviewing network entrepreneurs and operators. The conclusions and assumptions should be listed and approved by the client.

Typical questions to be asked are:

1. Define geographically your areas of interest.
   - Use a polygon to mark them on a map
2. Where do you intend to provide service?
   - Outdoor rooftop
   - Outdoor ground
   - Indoor window
   - Indoor
3. What is your investment potential?
   - Feasibility study
   - Pre-launch
   - Year 1, 2, 3
4. Do you intend to deploy the network at once or in phases?
   - How many phases?
5. Who are your target clients?
   - Residential
   - Stores
   - Small businesses
   - Medium businesses
   - Large businesses
   - Hotels
   - ISPs
6. List specific application that may use your services, for example, meter reading.
7. Does the area have video rental services?
8. Do you intend to offer services to tourists?
9. Do you plan to deploy additional technologies (WIMAX and LTE) in the future?
10. How does the area population fluctuate during in-season and off-season periods?
11. Do you expect to have nomadic clients?
12. Do you expect to have mobile clients?
13. List specific localities where you intend to provide service, for example, airport, coffee shops.
14. Do you have specific locations of large potential clients?
15. Do you intend to provide maritime service? Marinas? Near the coast?
16. Does someone else use the same spectrum as you? In your area? In nearby areas?
17. How do you intend to provide backhaul?
18. Where will your main equipment be installed?
19. Have you defined a marketing strategy?
20. Have you defined your sales channels?
21. Where will your sales stores be located?
22. Who will provide maintenance?
23. Do you have preferred vendors?
24. Do you have terrain and demographic databases available?
25. Do you know if this data is available from agencies in the area?

26. Do you have access to microwave frequencies for backhaul?
27. How much spectrum do you have access to and at what frequency ranges?
28. Is your spectrum owned or leased?
29. Are there restrictions for the use of the spectrum?
30. Do you have deployment commitments?
31. Where is the PoP (Point of Presence of optical fiber) available?
32. How is the connection to the Internet made? How is it charged?
33. What is the price per minute/kb for the Internet connection?
34. Do you have any agreement for site locations? Are you planning to negotiate one?
35. Any preferred sites?
36. What restrictions exist to deploy new sites? New towers?
37. What prevailing materials are used in are dwellings?
38. What kind of terminals do you plan to support?
    - rooftop
    - window
    - desktop
    - standalone
    - USB
    - PC card
    - embedded
    - phones
39. Do you plan to commercialize user terminals?
40. Do you plan to subsidize user terminals?
41. Describe the process to get licenses to build in the area? New towers? New poles?
42. Do you have to follow special construction codes? Proof against hurricanes, earthquakes?
43. How do you plan to process your billing?
44. How are you going to interconnect to the landline carrier? Are there fees?
45. Do you plan to provide Wi-Fi extensions?
46. What policy do you plan to implement to control network usage (downloads)?
47. What service plans do you envisage?
48. Do you plan to limit or charge for tonnage?
49. How many subscribers do you expect to have at signing? After 1 year? After 2 years?
50. Do you have a list of tower facilities in the area?
51. Do you have a list of high rise buildings in the area?
52. Do you plan to provide video backhaul services, that is, public surveillance? If yes, under which conditions?
53. How many ISPS are in the area?
54. Do you intend to provide service to ships? Where?
55. Do you plan to provide service to nearby areas?
56. Are you planning to rent phones to tourists?

1.6 Implementing the Business Plan

After a business case is prepared, the engineering plan can be used as a base for an RFQ (request for quote) if only budgetary numbers are required or an RFP (request for proposal) if firm number are desired.

Consultants and professional companies can tailor those documents to each operator's needs. A well-prepared RFP allows the selection of the most appropriate vendor for each deployment. One of the merits of an RFP is to make possible the comparison between different solutions.

After the proposals have been received, they should be analyzed, which is a major task because the understanding of the proposals requires a lot of experience with technology options and deficiencies. It is wise to select a short list of vendors and then arrange meetings with them.

Contract negotiations are also complex due to the many technicalities involved in wireless broadband deployments. The network deployment has to be followed up closely, as it will be hard to change things after the deployment has been made. It is strongly recommended that an expert closely follows the deployment.

System acceptance test is an extremely complex task, because the system is lightly loaded at acceptance time and many of load-related issues cannot be detected easily. This is where a planning tool is essential, by comparing the results for a lightly loaded system and extrapolating them for a loaded system.

Meanwhile all sales, marketing and administrative structure should be put in place. Then you are ready to proceed.